Nova Scotia Action Strategy on Global Warming – First Phase

A Draft

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Global warming requires international cooperation and commitment if it is to be successfully understood and responded to appropriately. Both Nova Scotia and Canada can benefit from taking a leadership role in this issue, particularly in the area of increased energy efficiency.

Canada has made a commitment towards limiting emissions of greenhouse gases by agreeing to work towards the stabilization of greenhouse gases at 1990 levels by 2000. Individual action programs to limit greenhouse gas emissions will be developed by federal and provincial governments. Since the production and consumption of energy is considered one of the prime contributors to global warming, the initial emphasis will be on improving energy efficiency, conservation, research and development of technologies, and alternative energy sources. In addition, Nova Scotia has appointed a Provincial Minister's Task Force on Clean Air that will examine the issue of global warming along with other air quality issues.

Total greenhouse gas emissions in Nova Scotia for 1990 were in the order of 38,200,000 tonnes in carbon dioxide equivalents[1]. Without any change in current energy policies this number is expected to reach approximately 48,800,000 tonnes in the year 2000. A strategy of stabilizing emissions of greenhouse gases at 1990 levels will mean that Nova Scotia must eliminate over 10 million tonnes of greenhouse gases in carbon dioxide equivalents by the 2000 from that expected through uninhibited growth patterns within the province. Following is the strategy which Nova Scotia has adopted to commence meeting the challenge.

1. Carbon dioxide equivalents provide a basis for comparing the greenhouse effect of various gases relative to CO_2. For example, 1 pound of methane results in greenhouse gas effect equal to that from 60 pounds of CO_2 (see Table 1, page 8).

Strategy

Stabilize Emissions of Greenhouse Gases at 1990 Levels

The goal of the Province of Nova Scotia is to stabilize man-made greenhouse gas emissions derived primarily from the production and utilization of energy resources at 1990 levels by the year 2000 or within a shorter timeframe if consistent with national and international consensus.

The measurement of changes in greenhouse gas emissions will be based on carbon dioxide equivalents and will be accounted for using a credit/debit system. In order to achieve this goal, the province will implement a multi-phased action strategy consisting of a series of measures which will be implemented through specific program initiatives. The selection of both measures and programs will be carried out in consultation with stakeholders and other levels of government. The key elements of this strategy are outlined in this document.

There are five key elements within the Nova Scotia Strategy.

1. Comprehensive Public Consultations

Nova Scotia will involve all principal stakeholders in the design, development, and implementation of the detailed elements of its management strategy for greenhouse gases.

Rationale:

The responsibility for the success of initiatives developed under this strategy will depend upon the involvement of business, industry, and the public in general, as well as all levels of government. Therefore, it is imperative that three groups be consulted.

Action:

Nova Scotia will identify principal stakeholders, provide information to assure greater understanding of the issues, and solicit their involvement in the identification and implementation of appropriate initiatives.

2. Multi-phase Approach

Nova Scotia will adopt a multi-phase approach to management of greenhouse gas emissions. Energy production and use play a major role in the generation of greenhouse gases. Therefore, within the multi-phase approach, each phase will address both the reduction of emissions at source and the control of growth in energy consumption.

Rationale:

The initial phase of the strategy will include economic, energy, and environmental actions which make sense in their own right. Actions initiated in this phase will be those considered to have immediate impact on the stabilization of greenhouse gases. Experience has shown that activities directed toward changes in behaviour, require much greater penetration in order to be effective. The initiatives adopted in subsequent phases of the strategy will be based on the results of those undertaken in the initial phase, increased understanding of global warming, analysis of financial and social implications of additional measures, and directions dictated by new international agreements.

Action:

Initial actions selected for the strategy will build upon existing initiatives, technologies and resources.

The impact of these actions will be maximized through an aggressive marketing strategy.

Actions will be examined in terms of financial and economic cost, environmental benefits, and social implications.

Special emphasis will be placed on the identification, development and implementation of actions which have potential to reduce more than one atmospheric pollutant.

3. Research and Development

Nova Scotia will undertake greenhouse gases research and development activities specific to the province and will pursue opportunities for assisting in the improvement of the scientific understanding of global warming.

Rationale:

Nova Scotia recognizes the need for aggressive research and development which addresses global warming in eastern Canada. This research will focus on the following areas of primary importance to Nova Scotia:

- reduction of greenhouse gas emissions at source;
- reduction of the growth in energy consumption; and
- identification of opportunities to enhance the absorption of carbon dioxide.

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2. A carbon dioxide sink is a process or mechanism which can reduce atmospheric carbon dioxide by absorbing more than it releases. For example, trees act as a carbon dioxide sink by absorbing more CO_2 as they grow than they give off as waste product.

Action:

An Office of Clean Coal Technology, to evaluate and aggressively promote new technologies that can be adapted to Nova Scotia coals, is being considered.

In addition to coal research and development specific to provincial coals, Nova Scotia will encourage and assist where possible in the national objective of exporting clean coal technologies to developing nations.

The Nova Scotia Power Corporation will expand and accelerate its research into and implementation of mechanisms which will control or reduce growth in demand for electricity.

The province will continue to identify, evaluate, and test for use in Nova Scotia, existing and future technologies directed toward: i) the reduction of energy consumption, particularly for transportation and heating, and ii) the introduction of alternate energy sources.

The province, in association with research organizations and other jurisdictions, will assess the potential of carbon dioxide sinks[2] in Nova Scotia in terms of their economic and technical viability.

4. Management System

Nova Scotia will develop a management system for the stabilization of greenhouse gases which is based on the concept of debits and credits for changes in greenhouse gas emission levels. The debits and credits system will be calculated and reported in terms of carbon dioxide (CO_2) equivalents. Existing levels of greenhouse gas emissions will constitute the baseline levels for the equivalency system.

Rationale:

Immediate action is necessary in managing greenhouse gas emissions effectively to address global warming concerns. Conducting inventories of greenhouse gas sources and calculation of their respective emission levels will be time consuming and require considerable financial investment. Of the five primary greenhouse gases[3], only carbon dioxide emissions can be readily calculated at present. Management of carbon dioxide emissions alone will only address part of the problem. Adopting a management approach which treats individual gases in isolation will further limit the opportunity to address global warming concerns within financial and social constraints.

Action:

Nova Scotia will equate changes in all greenhouse gas emissions in the province as debits and credits within an overall management regime to achieve stabilization of greenhouse gases according to the terms of future federal-provincial agreements.

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3. The five primary greenhouse gases are carbon dioxide, methane, chlorofluorocarbons, nitrous oxide, and ground level ozone.

5. Intergovernmental Cooperation

Nova Scotia will cooperate with the federal and other provincial governments in the development of mechanisms to ensure a coordinated approach to measuring and reporting progress on the reduction in greenhouse gases emissions.

Rationale:

In the interest of public consultation, it is imperative that our progress toward stabilization of greenhouse gas emissions be evaluated periodically and reported to the primary stakeholders and the public in general.

Action:

Nova Scotia will design a mechanism to monitor and report progress on the reduction of greenhouse gases in the province within the first year of phase one of this strategy and report annually thereafter.

Background

The international scientific community is concerned about the risk of global warming. Carbon dioxide, the major gas contributing to global warming (greenhouse gas), is measurably increasing in the earth's atmosphere. During the last fifty years there has been a rapid rise in atmospheric CO_2 levels. This trend has created concern that increases in greenhouse gases will accelerate the natural greenhouse effect resulting in unnatural warming of the earth's surface. If unchecked, this may lead to unacceptable changes in global ecology.

An Intergovernmental Panel on Climate Change (IPCC) was established in November 1988 by the United Nations and the World Meteorological Organization to provide a framework for international efforts on global warming. At their November 1990 Second World Climate Conference, the session noted need to improve climate data, analyses, and climate predictions. It also noted the inadequacy of climate observation/monitoring and climate change detection systems, and need for greater efforts to understand the impacts of climate change.

Human-source carbon dioxide emissions can be readily calculated based on knowledge of the primary sources and conversion of carbon in the combustion process to carbon dioxide. The calculation of emissions of other greenhouse gases is much more difficult. While control of potential emissions of some gases, such as chlorofluorocarbons, can be achieved through elimination of sources of the gas(es), it is not practical to assume such a management strategy for greenhouse gases in general.

To conduct inventories of gases requires both identification of potential sources as well as accurate calculation of the conversion of these sources into actual atmospheric gas emissions. Further science is required to develop inventory systems for greenhouse gases other than carbon dioxide. This will require considerable time as well as investment of financial and human resources.

In addressing concerns associated with global warming, it is important that both times and resources be utilized wisely and effectively. Therefore, achievement of greenhouse gas stabilization must be monitored by an alternative approach which does not require greenhouse gas inventories, but which focuses on adopting a method for calculating the relative amount of changes in emission levels.

Greenhouse Gases in Nova Scotia:

Nova Scotia, therefore, has adopted a credit/debit method based on CO_2 equivalents as its approach to the management of greenhouse gas reduction. This method is preferable since it is cost-effective, and allows for immediate action and flexibility in determining the types of measures which will be implemented to achieve the stabilization goal.

The implementation of the credit/debit method requires that a starting point be selected for measurement of changes in greenhouse gas emissions. Any man-made increase or decrease in emissions will be measured or calculated as debits or credits from that selected time.

The change in greenhouse gas levels is converted to carbon dioxide equivalents, and reported as either a credit (a decrease in levels) or a debit (an increase in levels). One example of a reduction in greenhouse gas which would be calculated as a credit is the

collection and utilization of methane from existing coal mining operations and from landfill sites. An example of an increase in greenhouse levels which would be calculated as a debit is the utilization of an additional industrial coal or oil fired boiler. The measurable credits from the methane program could be used to offset all or part of the measurable debits from the new boiler.

While these examples apply to the direct control of greenhouse gas emissions, this method can also be effectively applied to the benefits derived from energy conservation and efficiency improvement projects. When debits equal credits over a sustained period, stabilization of man-made greenhouse gases is achieved. The importance of reporting all measurements and calculations in carbon dioxide equivalents is evident if the debit/credit system is utilized and the management strategy is applied to all greenhouse gases.

Table 1 shows the contribution to the greenhouse effect of the various greenhouse gases and the ratios of heat absorption capacities of the various gases relative to CO_2 on a weight basis. These ratios form the basis for calculation of CO_2 equivalents.

Table 1

Greenhouse Gases

Gas	Contribution to Greenhouse Effect (%)	Heat Absorption Ratios (on a weight basis)
Carbon Dioxide	49	1
Methane	9	60
Chlorofluorocarbons	20	6,000
Nitrous Oxide	4	270
Ground Level Ozone	14	2,000
Other Gases	4	?

Source: The Canadian Climate Centre, Intergovernmental Panel on Climate Change, and Environment Canada.

In a global context Canada contributes approximately 2 per cent of worldwide CO_2 emissions. Nova Scotia contributions amount to about 3 per cent of Canada's total emissions and .06 per cent of worldwide CO_2 emissions. As shown in Table 1, however, carbon dioxide emissions only account for 49 per cent of the total contributions to global warming. The total emissions from Nova Scotia measured in CO_2 equivalents are estimated at 38,200,000 tonnes for 1990. Therefore, gases such as chlorofluorocarbons, methane, and ground level ozone which are also important contributors, must be considered in any management strategy which is designed to address global warming.

Calculations for 1988 show that carbon dioxide emissions in Nova Scotia amount to 17,700,000 tonnes. This total is derived from emissions related to the consumption of useful energy. It excludes such sources as slash burning, municipal solid waste incineration without energy recovery, etc. Figure 1 shows the distribution of CO_2 emissions among the various economic sectors of the province.

As shown in Figure 1, the electrical generation industry produced 40 per cent of the estimated provincial CO_2 emissions. Of this total, 82 per cent or 5,756,000 tonnes was emitted from coal-fired thermal generating stations. Thermal generation accounts for roughly 85 per cent of Nova Scotia electricity production.

The second largest sectoral contributor is the transportation sector which accounted for 27 per cent of calculated emissions. Within this sector, the primary sources of CO_2 are gasoline and diesel fuel oil for road transportation (80 per cent of the sectoral total) and heavy fuel oil in marine transportation (14 per cent of the sectoral total).

The third largest CO_2 producer is the residential sector which contributed 14 per cent of emissions. Light fuel oil and wood used for space heating accounted for 63 per cent and 23 per cent respectively of this sector's total.

Figure 1

Emissions of Carbon Dioxide in Nova Scotia — 1988
(Thousand of Tonnes)

CO_2 Producers	
A. Electrical Generation	40%
B. Industrial	11%
C. Commercial	8%
D. Residential	14%
E. Transportation	27%

Source: N.S. Department of Mines and Energy

The industrial sector produced 11 per cent of the provincial total. Heavy fuel oil and wood, primarily used for process heat and energy in the pulp and paper industry, accounted for 38 per cent and 26 per cent respectively.

The lowest sectoral emissions came from the commercial/institutional/public administration sector which supplied 8 per cent of the provincial total. Light fuel oil and diesel oil used for space heating and transportation purposes were responsible for 49 per cent and 18 per cent of the sectoral total.

Action

The term "action" is used within the Nova Scotia strategy to mean specific activities which are designed to bring about a particular type of change in the way in which we live or do things. Within each action a series of programs will be developed which, although initiated by government, must be implemented through government, private industry, and public partnerships.

Appended is a partial list of past and current actions undertaken by Nova Scotia relating to energy conservation and efficiency, and clean coal technologies. These are provided as examples of actions which may be selected and built upon in the initial phase of the strategy. Similar actions may also be included in subsequent phases.

Appendix

Current and Past Initiatives Related to Global Warming Issues

Enhance the development and adoption of technology through demonstration projects of the technical and economic viability of oil alternatives and research into the barriers limiting their use.

Investigate, analyze, and transfer technologies for efficient energy production and use.

Develop a comprehensive investment/financial support program designed to stimulate investment in new technologies and maximize private sector participation.

Increase technology marketing activities particularly through joint ventures with the private sector.

Improve efficiency in residential energy use through delivery of services to the energy consumer, housing industry, and government agencies concerned with housing.

Improve efficiency of commercial and industrial energy use in the province and increase the use of renewable energy resources, including forest biomass.

Implement a long range facility plan on a government-wide basis encompassing coordination and implementation of recommendations of energy audits conducted on public buildings.

Develop and implement training programs for student, adult, and trade/vocational audience to effect improved energy efficiency practices.

Provide energy advisory services to the public, business, and industry which will assist in reducing their energy costs and encourage the conversion to indigenous resources where cost-effective and where recommended benefits can be demonstrated.

Nova Scotia will continue to meet its commitment to the Canada–Nova Scotia Acid Rain Agreement through removal of sulphur prior to combustion through advanced coal cleaning techniques and the capture of sulphur during combustion such as in fluidized bed technology.

Nova Scotia will address coal-related emissions of greenhouse gases through continuing participation in integrated coal gasification combined cycle programs which emphasize greater efficiency in the conversion of coal to electricity and through the capture of methane from existing and future mining operations for utilization as an energy resource.

A study of the transportation sector in Nova Scotia will be undertaken to identify opportunities for reducing energy use and hence greenhouse gas emissions.